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# SCIENCE OF GROUND MECHANICS AND FOUNDATIONS: ITS PRESENT STATUS AND PROBLEMS OF DEVELOPMENT

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At present, the load on a column of a factory building is measured in thousands of tons, reaching 3,500 and even 7,000 tons. There is need for a theory of structural mechanics of dispersive bodies, as opposed to ordinary plastic bodies like metal or wood, to enable us to study complex foundations consisting of the system: ground, gas, vapor, water in its three states. Unfortunately, present studies, even doctoral dissertations, do not take into consideration the peculiar statics of a dispersive body, but are merely concerned with ideal mechanial phenomena never encountered in nature.

Analysis of piling in foundations leads to the conclusion that separate groups of piles of ordinary size should be replaced by piles of great diameter and great supporting power spaced a considerable distance apart. Equipment has been constructed that handles piles one meter in diameter which are driven to great depths. Drilling up to 5 meters in diameter is now possible; and shafts are being sunk without strengthening walls, which are held by clay solutions instead of bracing. Such shafts may be considered essentially as piles of tremendous diameter.

The new science of ground mechanics must study clay solutions and calculate their consistency as a function of shaft depth and other conditions. The method of hardening ground by means of sandy layers can strengthen weak clayey ground with a bearing capacity of only 0.1 kg per sq cm so that it can bear 2 to 3 kg per sq cm after pressing. The theoretical study and solution of the problem of hardening weak clayey ground and its dependence upon load and equilibrium have been taken up only recently by D. Ye. Pol'shin and V. A. Florin. B. A. Rzhanitsyn has developed another method of artificially strengthening grounds by chemicals, which is especially useful for fixing macroporose loess-like wet grounds or clayey soil. Yu. M. Ablev has conducted similar experiments.



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B. P. Popov is now investigating the frequency of blows of various types of pile drivers in dependence upon soil types, etc. D. D. Barkan, after many years of investigations, has worked out a method of sinking piles and slots by means of vibrations, which is especially effective in sandy ground. P. P. Argunov has designed vacuum air lifts for use in "iglofilters" /needle filters/ that do not require the drilling of wells to drain off ground waters. N. G. Trupak has popularized a method of freezing wet ground in foundation work; former failings of this method have been eliminated by the method of deep freezing, in which very low temperatures are obtained in the freezing network with ammonia and carbon dioxide.

In the analysis of conditions governing the washout of ground, greater accuracy of determination of Renolds number for various grounds is needed; this number varies from 0.1 to 1, according to the author. M. H. Gol'dshteyn is attempting to express the structure of grounds by numerical indices, but much work remains to be done especially in connections with ground dislocation and displacement in loess-type and saturated grounds. A. F. Lebedev, a great scientist and author of a work on the origin of ground waters, is also at work on this problem. This investigation goes under the name: strengthening of ground according to various degrees of wetness.

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